

**A Presentation for**

# **Advanced Turbine Systems Annual Program Review**

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***RealEnergy provides a distribution channel for environmentally clean energy technologies.***

***Our mission is to build, own and operate private energy infrastructure to provide power service alternatives including low cost, high reliability, high quality, 'clean and green' energy for today's power intensive users.***

***RealEnergy will earn portfolio as the real estate owner's provider***



## Section 1

# RealEnergy

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## **A Distribution Channel**

### **Commercial Real Estate's Energy Provider**

- **Convergence:**
  - **Deregulation**
  - **New generation technologies**
  - **Grid uncertainty**
- **RealEnergy's existing client/partners own over 290 million sf of real estate**
- **North American commercial real estate market:**
  - **20 billion square feet of space**
  - **\$50 billion in annual retail energy purchases**
- **RealEnergy Strategic Distribution Model:**
  - **Creating energy demand through strategic client/partners**
  - **Creating technology and supply certainty through strategic investments**
  - **Delivering high efficiency and value by integrating appropriate technologies**
  - **Dominating the market with fast growth and long term contracts**



# Key Real Estate Shareholders

Company Affiliation	Property Type [2]	Geographic Focus	Investor	Real Estate Owned (S.F.)
AEW Capital	Mixed	National	Principals	35,000,000
ARDEN Realty	Office	S. California	ARDEN	22,000,000
Berkshire Development	Industrial/Retail	Northeast	Owner	4,500,000
CharlesBarr Capital	Mixed	National	Principals	6,500,000
DIVCOWest	Office	California	Principals	7,000,000
Elkor Realty	MF /Hospitality	West /Midwest	Principals	4,700,000
Ezralow Holdings	MF /Retail	West	Principals	5,100,000
Layton-Belling & Assoc.	Office	West	Principals	4,200,000
Leggat McCall	Mixed	Northeast	Leggat McCall	8,000,000
Lubert-Adler	Mixed	National	Principal	15,000,000
MacFarland Partners	Retail	West	Principal	5,000,000
Opportunity Fund (I-Barr)	Mixed	National	Principal	4,500,000
Opus Development	Mixed	National	Principal	50,000,000
R & B Realty	Multi-Family	National	Principal	10,000,000
Spaulding & Slye	Mixed	Northeast	Principals	11,000,000
Walton Street Advisors	Mixed	National	Principals	100,000,000
W.E. Simon & Sons	Mixed	National	Principals	5,500,000
<b>Total</b>				<b>298,000,000</b>

In addition to our current investors, RealEnergy principals have long term successful relationships that span the entire breadth of the Commercial Real Estate markets including:

- US Pensions
- REITS
- Investment Advisors
- Insurance Companies

Estimated Energy Consumption	\$ 745,000,000	\$ 2.50 psf
Estimated Energy Consumption MWh	5,960,000	20.00 Watts per S.F.
Est. Generation Required for Above (Mw)	1,361	50% Load Factor
RealEnergy Proj. Distr. Generation (Mw) [1]	476	35% of total energy use



# Shareholders /Board Members

## Shareholders /Board Members

Investor	Sector	Background
<b>Advisory Board</b>		
Robert C. Accomando, P.E	Real Estate	Arden Realty
Dean Adler	Real Estate	Lubert-Adler, Principal
Joseph Azrack	Real Estate	AEW Capital, CIO
William Chadwick	Real Estate	Chadwick, Saylor, Founder
Chip Douglas	Real Estate	CharlesBank Capital Partners, Principal
Michael Dumke	Real Estate	DIVCO West, Principal
John Dunning	Venture Capital	Cross-Fire Ventures, Principal
Steve Layton	Real Estate	Founder, Layton-Belling & Associates
Malcolm Lewis	Energy	CTG, Inc. (Mechanical Engineering Firm), Owner
Amory Lovins	Energy	Rocky Mountain Institute (RMI), Founder
Victor MacFarland	Real Estate	MacFarland Partners, Founder
John Montenegro	Energy	Power Plant Developer
<b>Board of Directors</b>		
Kevin Best	Energy	RealEnergy, Founder; Genesis Energy, Founder
Bill Browning	Real Estate /Energy	Rocky Mountain Institute, Director
Daniel Cashdan	Real Estate	RealEnergy, Founder; Chadwick, Saylor, Managing Director
Steven Greenberg	Energy	RealEnergy, Founder; P G & E; Herwood Energy Services
Stuart Shiff	Real Estate	DIVCO West Properties, Principal
Paul Syle	Real Estate	RealEnergy, Founder; AEW Capital Management; Chatham

RealEnergy has already brought together key members of the real estate community, and significant members of the energy sector.

RealEnergy will build on this valuable base of investors / advisors.



## **PowerPark /PowerTower Three Step Process**

### **Phase I – Green/Brown Commodity Power Indexed to Retail Price**

- **Install generating assets to produce approximately 30% of facility peak demand**
  - **Provide site owner financial incentive**
  - **Improve facility load profile for future commodity contract**
  - **Prepare to monetize environmental and grid benefits**

### **Phase II – Power Reliability Services**

- **Install additional generating assets to produce over 100% of facility peak demand**
  - **Charge site owner premium for higher reliability**
  - **Owner creates value for occupant or tenants, captures new revenue or billing stream**
  - **Prepare to dispatch excess capacity based on market signals**

### **Phase III – Power Quality Services**

- **Install energy storage and conditioning assets**
  - **Charge site owner premium for higher power quality**
  - **Owner creates value for occupant or tenants, captures new revenue or billing stream**
  - **Owner achieves marketing /asset positioning benefits**
  - **Up to 99.9999% reliability**

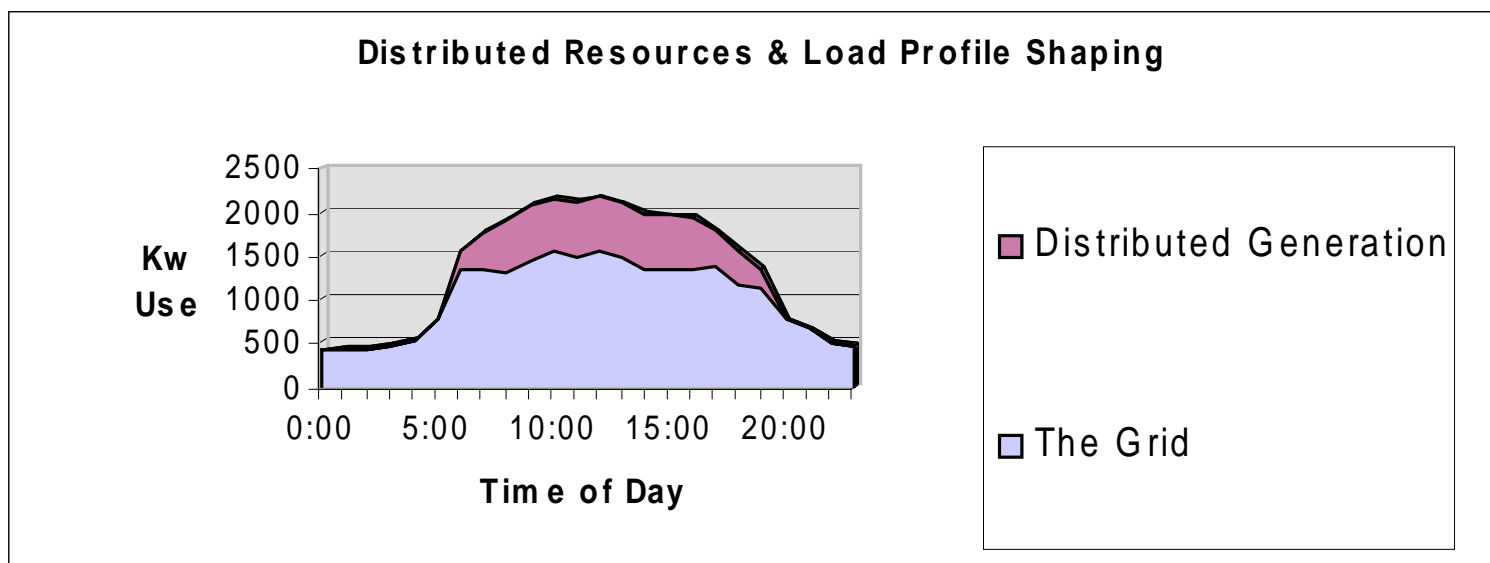




## Load Profile – On Site Generation's Impact

### RealEnergy's Technologies Create Value:

- Increased revenue/lower cost for the site owner
- Improved load shape for commodity purchasing
- Infrastructure in place for Phase II or III



**RealEnergy**

**Clients - ARDEN Realty**



## **Clients – Layton-Belling & Associates**





## Clients – DIVCOWest Properties





## **Clients – Pleasanton PowerPark**







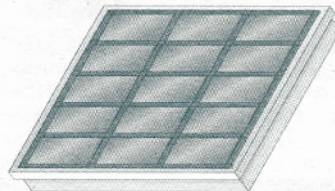
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## Pleasanton PowerPark

### Pleasanton Power Park's electric ambitions

When completed, the industrial park hopes to generate all the power it needs on the premises using a range of technologies.

- ① Photovoltaic solar panels totaling 340 kw are to be placed on the roofs of three of the buildings at a cost of \$2.7 million.

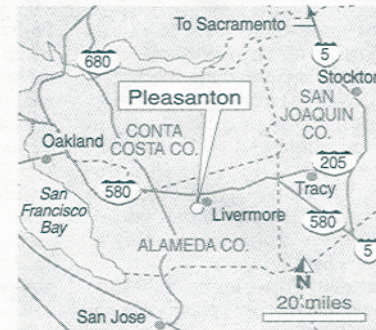
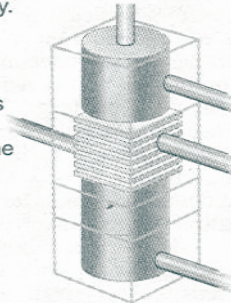


Phase 3 is tentatively scheduled to be completed by spring 2001.

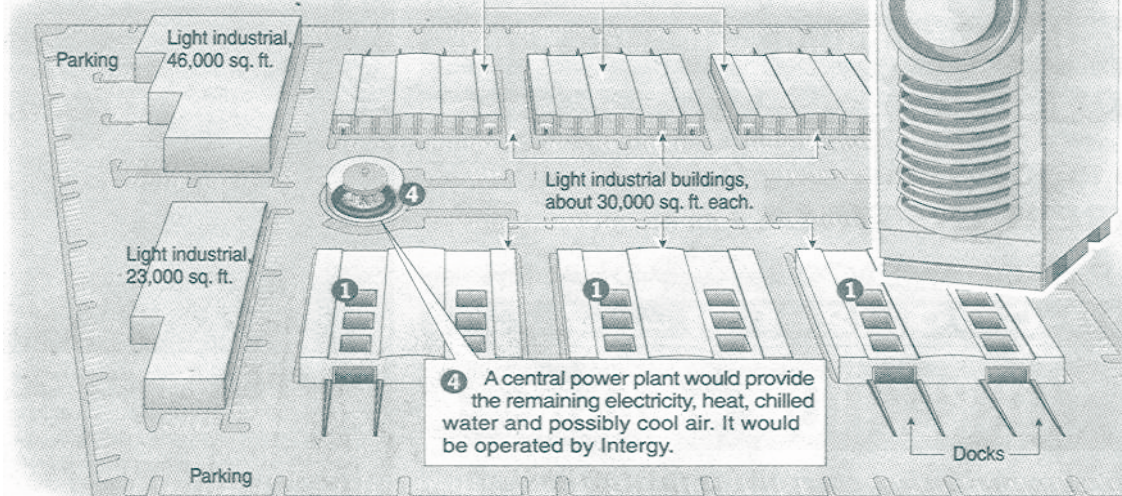
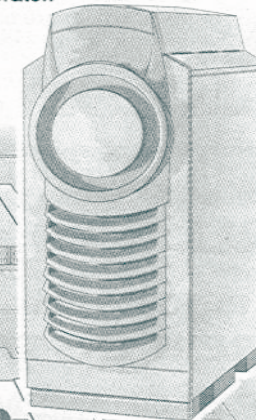
Phase 1 Phase 2 Phase 3

- ② Plans call for one building to house a fuel cell that runs on natural gas to produce electricity.

One of these three buildings would house the fuel cell.



- ③ All of the buildings will have at least one microturbine, a generator about the size of a refrigerator.





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## **PleasantonPowerPark**

### **DER Technologies for PPP**

#### **Generation Resources (kilowatts)**

1. **340 kW Photovoltaics - (blend of renewable to promote environmental stewardship)**
2. **Microturbines - (several small gas turbines distributed throughout the PowerPark)**
3. **Fuel Cells - small, medium and large fuel cell technologies**
4. **Combined Heat/Power/Chilled Water (CHPCW) - (district gas cooling)**
5. **Simple Cycle Turbines - (45 MW local area reliability station)**
6. **Grid connected electrical service**

#### **Storage and Demand Side Resources (negawatts)**

1. **100kWh modular energy storage - (environmentally benign advanced storage devices)**
2. **Thermal Energy Storage – 800,000 gallon water storage**
2. **Direct Current Lighting - (more efficient lighting from DC sources)**
3. **Variable Speed Motors/Drives - (significantly lower energy use)**
4. **Enterprise Dispatch/Control - (web-enabled to manage power production/load)**

#### **Technologies Under Review**

1. **Chilled water production - night sky radiation**
2. **Rotating storage**
3. **High temperature solar thermal-electric**
4. **Hydrogen generation off-peak - storage**





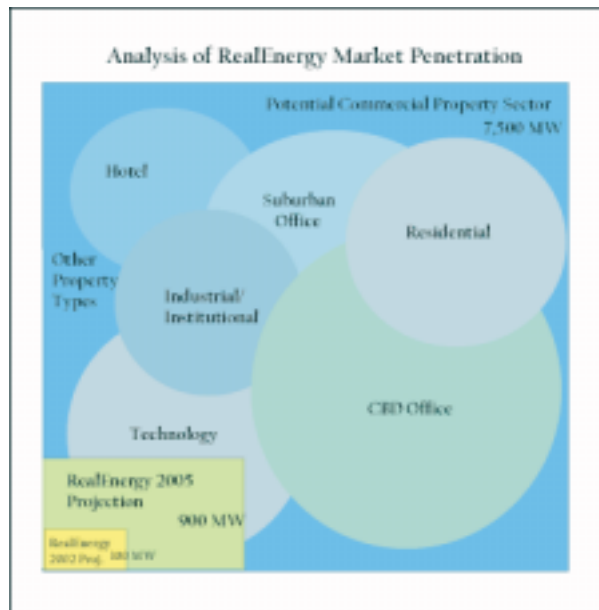
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## **Pleasanton Power Park**

### **Partial List of Committed Stakeholders**

- **RealEnergy - Energy Developer**
- **Panattoni Development - Building EPC Contractor**
- **DTE Energy (Detroit Edison) - PV Lessor**
  
- **California Energy Commission - \$1,000,000 Renewable Buydown**
- **Department of Energy – NREL**
  
- **BP/Solarex - Solar Panel Manufacturer**
- **AstroPower - Solar Panel Manufacturer**
- **PowerLight Corporation - PV System EPC Contractor**
- **Nextek, Inc. - DC Power Technologies**

## **Projected Market Penetration**

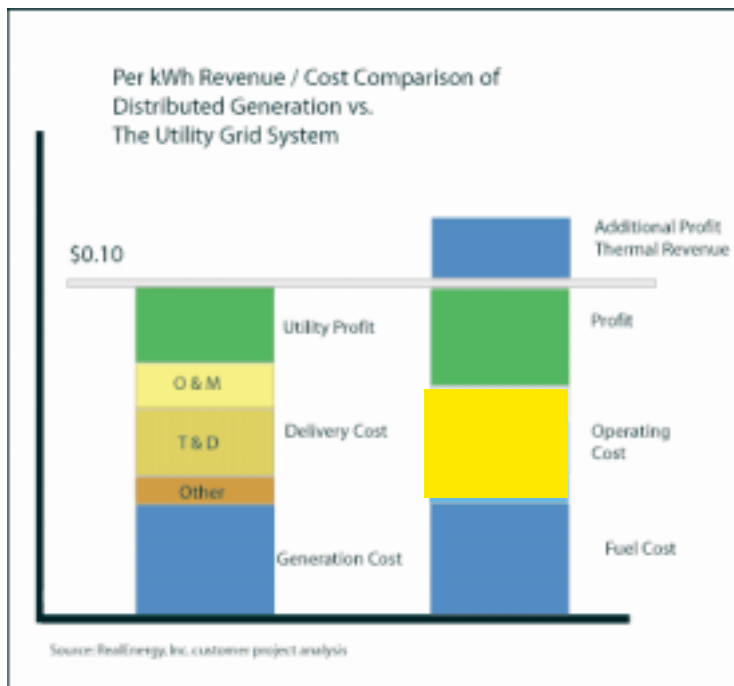


### **RealEnergy's Commercial DG Market Penetration**

- **Current Clients - 500 MW demand (Phase I)**
- **2001 Projection - .5% of commercial DG market**
- **2002 Projection - 2% of commercial DG market**
- **2005 Projection - 12% of commercial DG market**



## RealEnergy's Economic Model



### RealEnergy's Economic Model

- **RealEnergy designs owns and operates generators in commercial properties owned by our customers.**
- **RealEnergy competes with delivered price of electricity**
  - **Avoided transmission & delivery cost**
  - **Improving micro generation efficiency**
  - **Cogeneration creates additional economic advantage over grid power**
- **Potential for Premium Power upgrade with increased margin for RealEnergy (and customer)**



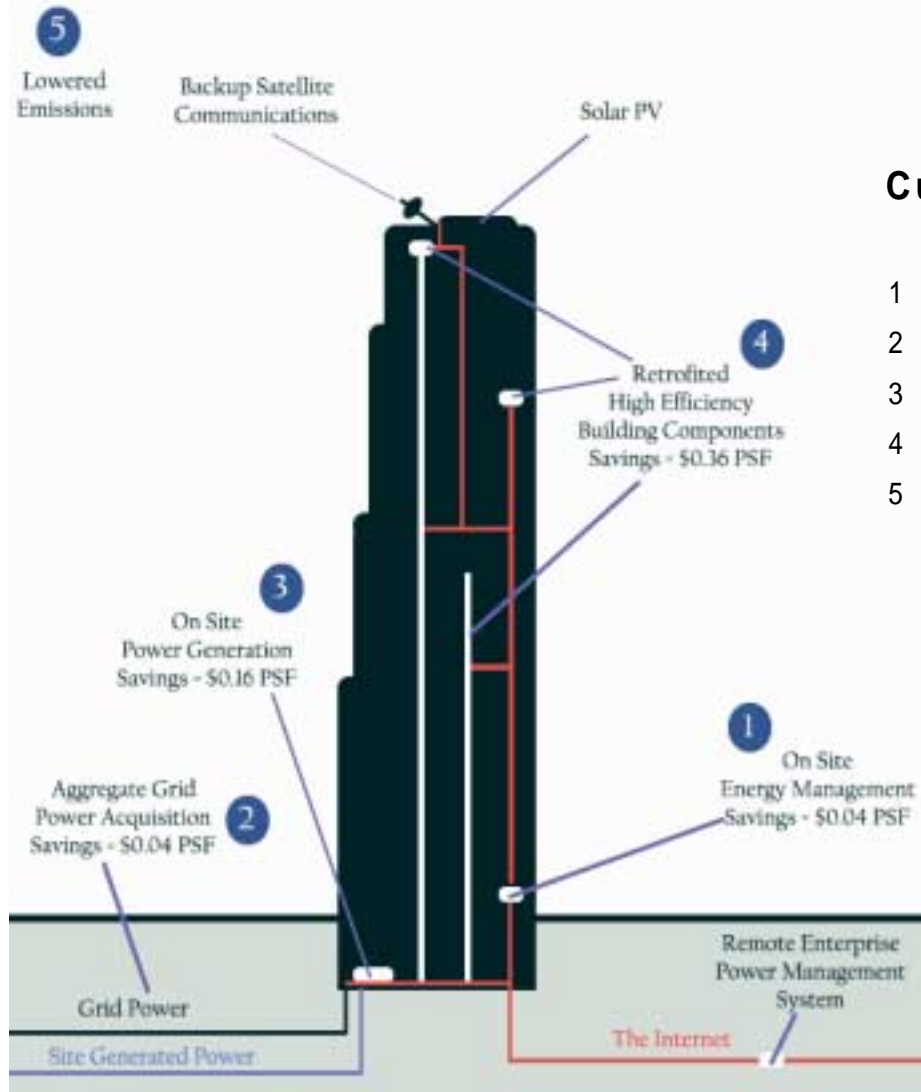
## **Section 2**

# **Cost Reductions**

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## Energy Cost Reductions - SF/YR



Current Energy Costs/SF/YR: **\$2.50**

### Reductions:

1	OnSite Energy Management	\$ 0.04
2	Aggregated Grid Power	\$ 0.04
3	OnSite Power Generation	\$ 0.16
4	Efficiency Retrofits	\$ 0.36
5	Emissions Credits	\$ -
	<b>TOTAL</b>	<b>\$ 0.60</b>

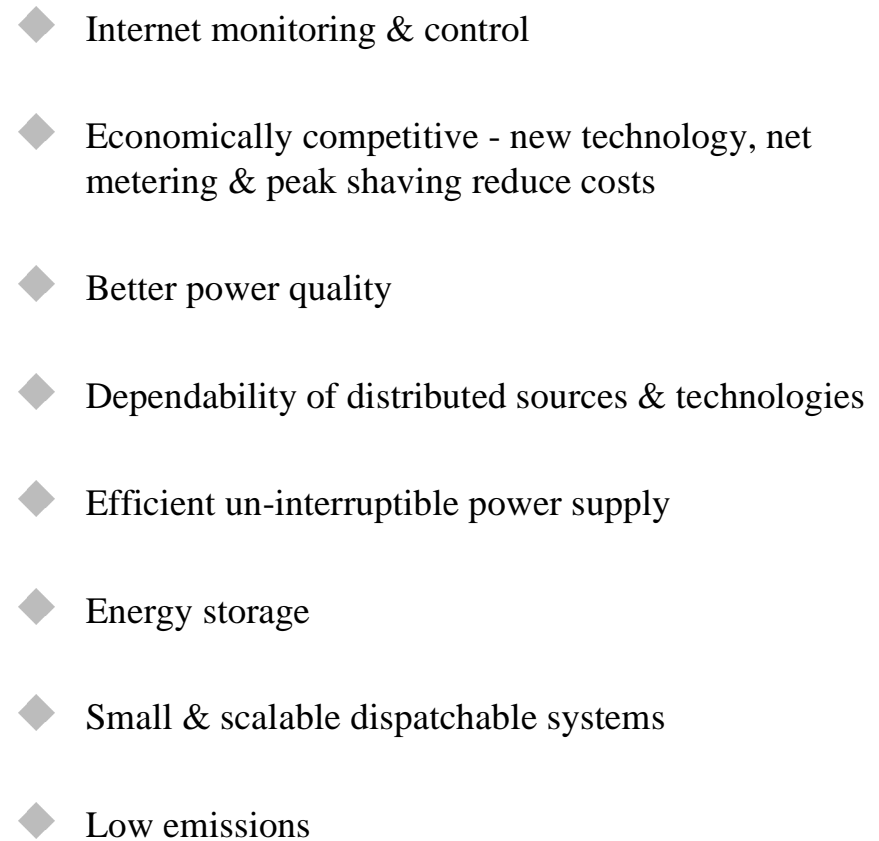


## **Section 3**

# **The Technologies**

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## The Technologies

# Distributed Generation Technology Today

Equipment Type	Output kW	Installed Cost /kW Non-CoGen	Installed Cost /kW CoGen	Operation & Maint. per kWh	Fuel Cost per kWh at \$4.00/MMBtu	Total Operating Cost per kWh	Annual Gen. Capacity kWh	Est. Revenue @ \$0.11 per kWh [1]	Single Unit Installed Cost Co-Gen	Annual Revenue in [6]	Total Operating Cost
INTERNAL COMBUSTION ENGINE											
CAT G-3306TA	150	1250	1850	\$ 0.0150	\$ 0.055	\$ 0.070	468,000	51,480	\$277,500	\$113,256	\$32,760
CAT G-3412TA	290	1250	1850	\$ 0.0150	\$ 0.055	\$ 0.070	904,800				
Daewoo 220	220	704	1100	\$ 0.0150			686,400		\$140,800		
Electryon 6M	No Specifications at this time.										
Jenbacher JMS 321	600	750	1250	\$ 0.0150							
Jenbacher JMS 316	800	750	1250	\$ 0.0150							
Jenbacher JMS 320	1,000	750	1250	\$ 0.0150							
FUEL CELL											
PLUG Power [2]	7	-	2700	\$ 0.0075	\$ 0.050	\$ 0.058	21,840	2,402	\$18,900	\$5,285	\$1,256
Ballard P2-D	250	-	4500	-	-	-	-	-	-	-	-
ONSI [3]	200	-	4500	\$ 0.0050	\$ 0.045	\$ 0.050	624,000	68,640	\$900,000	\$151,008	\$31,200
Fuel Cell Energy [4]	250	-	4500	\$ 0.0050	\$ 0.027	\$ 0.028	780,000	85,800	\$1,125,000	\$188,760	\$21,996
Siemens Hybrid [2]	250	-	4500	\$ 0.0075	\$ 0.047	\$ 0.055	780,000	85,800	\$1,125,000	\$188,760	\$42,510
MICRO TURBINE											
Capstone 330	28	1250	1800	\$ 0.0050	\$ 0.058	\$ 0.063	87,360	9,610	\$50,400	\$21,141	\$5,504
Capstone 660	57	1000	1450	\$ 0.0050	\$ 0.055	\$ 0.060	177,840	19,562	\$82,650	\$43,037	\$10,670
Ingersol Rand Elliott	No Specifications at this time										
Parallon 75	75	1300	1900	\$ 0.0050	\$ 0.059						
Paragon 250	No Specifications at this time										
MINI TURBINE											
Solar Mercury 50	4,200	900	1050	\$ 0.0140	\$ 0.047	\$ 0.061	36,540,000	4,019,400	\$6,400,000	\$8,842,680	\$2,228,940
Kawasaki GPB-15X	1,400	1500	1800	\$ 0.0140	\$ 0.058	\$ 0.072	12,180,000	1,339,800	\$2,100,000	\$2,947,560	\$876,960
GE PGT2	2,000	1225	1525	\$ 0.0150	\$ 0.062	\$ 0.077	17,400,000	1,914,000	\$2,900,000	\$4,210,800	\$1,339,800
GE PGT10B	10,800	747	1100	\$ 0.0075	\$ 0.048	\$ 0.051	93,960,000	1,914,000	\$6,800,000		
Pratt Whitney ST-18	1,961	1500	1550	\$ 0.0014	\$ 0.057	\$ 0.075	17,060,700	1,876,677			
Pratt Whitney ST-30	3,340	1450	1500	\$ 0.0014	\$ 0.055	\$ 0.072	29,058,000	3,196,380			
Pratt Whitney ST-40	4,039	900	1175	\$ 0.0013	\$ 0.050	\$ 0.069	35,139,300	3,865,323			
SOLAR CELL											
BP/Solar [5]	100	6000	N/A	\$ -	\$ -	\$ -	312,000	34,320	\$600,000	\$75,504	\$0
Seimens [5]	100	6000	N/A	\$ -	\$ -	\$ -	312,000	34,320	\$600,000	\$75,504	\$0
Other [5]	100	6000	N/A	\$ -	\$ -	\$ -	312,000	34,320	\$600,000	\$75,504	\$0

Notes: [1] - Projected run cycle of 3,160 hours per year (12 hours per day, 260 days), actual utility rates and the rates at which RealEnergy will charge may vary. [2] - These technologies are currently under development and will soon be commercially available. [3] - Price includes rebate. [4] - Technologies in early development, no data available. The above estimates are meant to describe the general operating characteristics, in most cases, these are preliminary projections. [5] - Estimated Cost & performance. Solar subject to subsidies & grants to reduce cost. RealEnergy is currently engaged in a detailed underwriting of all of these technologies. [6] - Thermal revenue based on avoided cost at \$0.06 per therm.







## The Technologies

# Manufacturers – Astro Power



- Astro Power
  - California based manufacturer of solar panels for flat and vertical mounting
  - Available in any several sizes and configurations
  - California status creates additional incentives





## The Technologies

# Manufacturers – Fuel Cell Energy



- Fuel Cell Energy
  - Manufactures fuel cells from 250 kW to over 2 MW
  - Fuel Cell Energy's units operate at higher temperatures than traditional PEM Fuel Cells
  - Fuel Cell Energy has units in operation in Connecticut and California
  - RealEnergy will target Fuel Cell Energy fuel cells for on-site co-generation only in larger applications
  - RealEnergy's co-generation fuel cell units will provide hot water, heat and/or cooling to our client's buildings
  - RealEnergy has set realistic implementation time-frames for the installation of fuel cells, starting in the Summer of 2001





## The Technologies

# Manufacturers – Plug Power



- PLUGPower
  - Manufactures a 7 kW fuel cell
  - PLUGPower has targeted the residential market as well as commercial
  - Using natural gas, PLUGPower's generators produce negligible levels of emissions
  - RealEnergy will target PLUGPower fuel cells for on-site co-generation only
  - RealEnergy's co-generation Plug Power units will provide hot water, heat and/or cooling to our client's buildings





## The Technologies

# Manufacturers – Alliance Power

- Alliance Power
  - Exclusive manufacturer of Kawasaki 1.4 MW and GE 10 MW units with Catalytica XONON technology
    - Only near zero emissions units on the market today, with no toxic chemicals



**Kawasaki 1.4**



## The Technologies

# Manufacturers – Capstone Turbines



- Capstone Turbines
  - Manufactures a 30 kW and 60kW stationary generator
  - Recently raised capital through an initial public offering
  - First production unit sold in 1998
  - RealEnergy will use the Capstone 330 and 660 units for:
    - On-site co-generation
    - On-site electric only peak shaving
  - RealEnergy's co-generation Capstone units will provide hot water, heat and/or cooling to our client's buildings





## The Technologies

# Manufacturers – HESS MicroGen



- HESS MicroGen
  - A division of Amerada HESS Oil, a New York based independent energy company
  - Currently offer two generation systems
    - 100 kW built on a domestic short block
    - 200 kW built in a Daewoo generator
  - System utilizes the following innovations:
    - Chilled intake to increase output
    - High rise intake for improved efficiency
    - Automation system which controls unit and chiller on site and remotely



## **Section 4**

# **The Projects**

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**PROJECT – 1900/1901 Avenue of the Stars**

## **DivcoWEST & Distributed Generation**



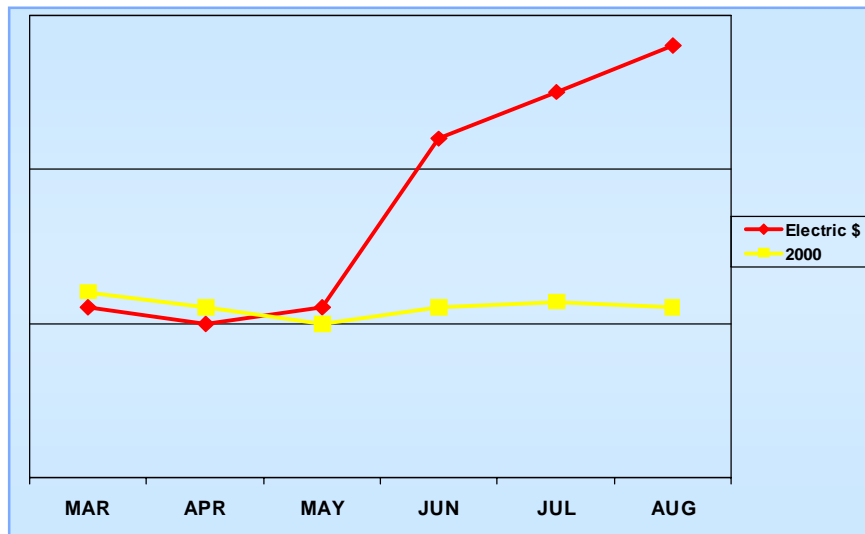
- Two vintage full service office towers totaling over 1.1MM SF
- Utility electric, thermal energy from Sempra central plant
- Three (3) 200kW Natural Gas Fired Internal Combustion Engines in each building
- Heat Recovery Unit (each building)
- 175 TON absorption chiller (each building)
- Cooling Tower (each building)
- 3,000 annual kW hours (38%)





## Project – Imperial Bank Tower

# Arden - Distributed Generation



- EiS wiring complete – Silicon Energy
- Energy reductions of 19% in six months
- 250% increase in electrical costs over three months (June – August 2000)
- Vintage full service office tower totaling over 540M SF
- SDG&E electric (single 12 kv); Two 600 ton and one 165 ton chiller and towers
- Scheduled \$1.3MM HVAC retrofit 2001
- Three (3) 200kW Natural Gas Fired Internal Combustion Engines
- Heat Recovery Unit
- 450 TON absorption chiller
- Cooling Tower
- 4,032 annual kW hours (46%)



## PROJECTS – 19000 Macarthur & 1500 Quail

# LBA – Distributed Generation



- EiS wiring systems installed(
- (10) 60 kW Capstone Microturbines each
- Two vintage full service office towers
- 450 ton absorption chiller
- Cooling Towers
- Over 3,000 annual kW hours (>38%)



## **Section 5**

# **Energy Information Systems**

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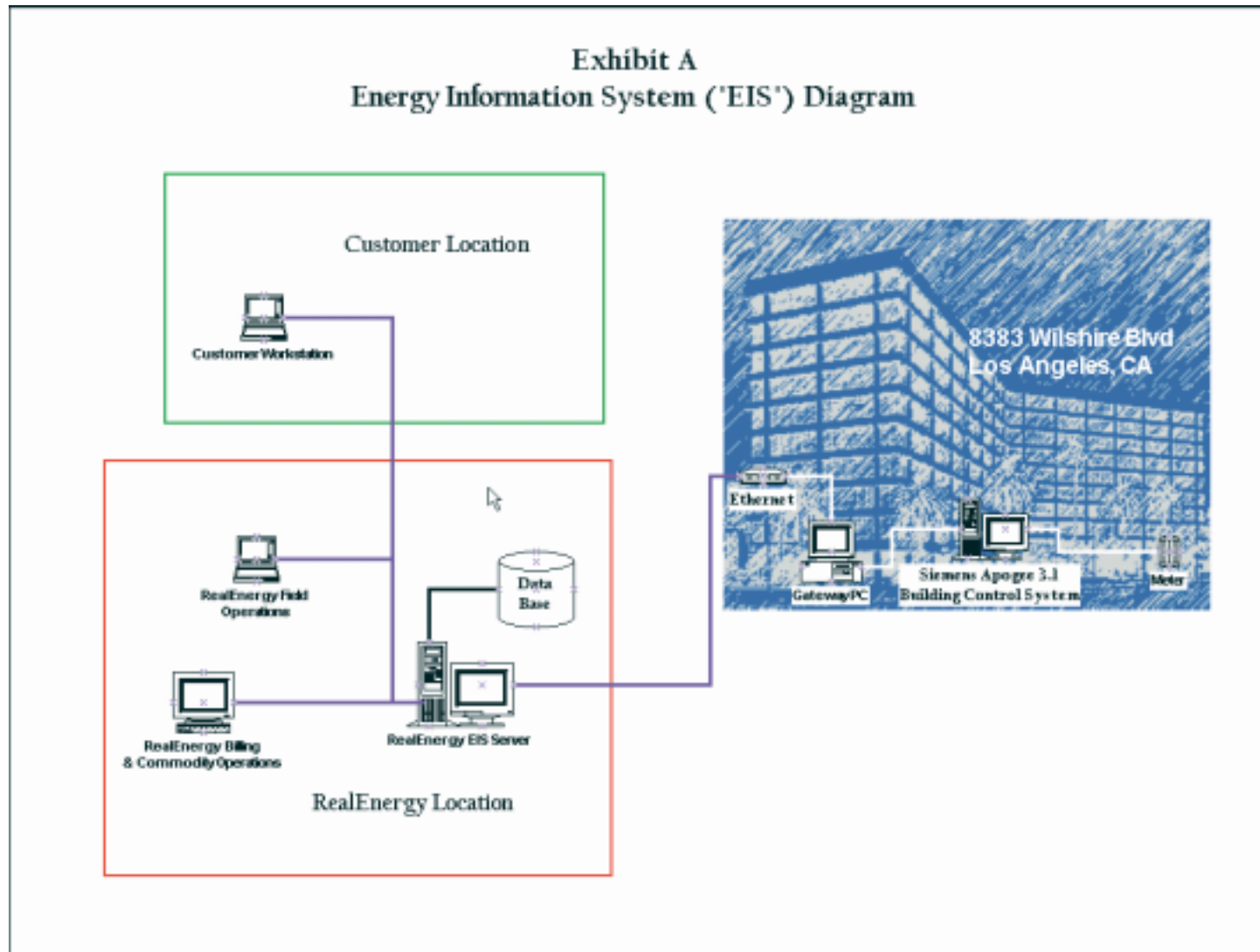
## **Portfolio Energy Management Services**

**RealEnergy uses web based technologies to perform:**

- **Billing (Customer and Tenant)**
- **Commodity purchasing**
- **Distributed Resources monitoring and control**
- **Energy optimization**
- **Portfolio energy information services (energy data management)**
- **Rate and Tariff Audit and Analysis**



# Typical Building EIS Wiring Diagram



## **Section 6**

# **Conclusion**

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## Conclusion - Barriers

- **Interconnection** – Not a major issue for RealEnergy systems sized for on-site consumption of electricity. Interconnection for two way power flow very difficult still.
- **Standby Charges** – Created after PURPA for 49 MW plants that could impact T&D system.

***Demand charges should apply to load and DG equally.*** SDG&E suggests current limiting devices sized to the DG production. This eliminates our use of the grid during off-peak. Utilities want more effective use of the grid, DG offers this *and* grid relief during peak periods. Forcing us to island loads under-utilizes all of our assets.

- **Gas & Electric Utilities** – Monopoly power should not be used to force customer generation decisions. A ‘firewall’ between these gas and electric entities should eliminate the manipulation of gas access to result in electric utility benefit.

We serve the same clients. Let’s give the customer true open access choice, recognizing the benefits of DG to the customer, the utility and the environment.



## **Conclusion - Milestones**

- **Since its inception, RealEnergy has achieved the following milestones:**
  - **Creation of captive client base with over 290 million S.F. of property**
  - **Execution of several exclusive contracts with technology suppliers**
  - **Execution of contracts with clients to implement distributed generation systems**
  - **Implementation of Energy Information System**
  - **Negotiation of Utility Interconnection Agreements**
  - **Establishment of market presence – first mover advantage**
  - **Project mobilization**
  - **Turned a timely idea into reality**

